



Policies for a Proposed Reuse Enablement System (RES)

NASA Earth Science Data Systems (ESDS)
Software Reuse Working Group (WG)

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- General RES Background
 - Overview of Policies Document
 - Background
 - Development
 - Policy Areas and Outline
 - Example Policies
 - Plan for Future RES Work

- A survey on the reuse practices of the Earth science community was conducted in 2005, with OMB approval (01/04/2005, Approval Number 2700-0117).
 - We received 100 responses from ~3000 invitations to participate.
- Key results of the survey were:
 - Developers need to be able to easily locate and evaluate available reusable artifacts.
 - A catalog or repository for reusable artifacts is one of the best means of increasing software reuse within the community.
- The Reuse Working Group recommended the establishment of a reuse catalog/repository subject to the findings of a technology evaluation / architecture study.
- In response, NASA Headquarters tasked the Working Group to look at the roles of the GCMD, Open Source Agreement site, and other sites in serving the community and meeting reuse needs.



- A **trade study** was conducted, evaluating a variety of sites on their ability to function as a software reuse enablement system for Earth science software developers.
- The trade study concluded that **none of the existing operational sites fulfilled the role of a software repository for the Earth science community**.
- Previously developed **use cases and requirements** were formalized.
- Upon completion of the trade study, the Working Group performed an **architecture study** to determine the most suitable way to create the recommended reuse catalog/repository.
- The architecture study concluded that using the **XOOPS content management system with appropriate modifications** would be the best option for creating a Reuse Enablement System that will provide the community of Earth science software developers with a catalog/repository of reusable software assets.
- Based on the results of the architecture study, the WG developed a **prototype RES** to demonstrate the feasibility of the system.
- Upon completion of the architecture study, the Working Group developed a **set of policies** for the operation and maintenance of the proposed RES.

- In WG telecons and meetings discussing RES work, a number of potential policy issues were acknowledged and noted, but not explored in depth.
- After initial development of the RES prototype, suggestions for improvement were received from WG members and participants in the 2007 ESDSWG Meeting, and much of the feedback received was also pertinent to RES policy issues.
- Realizing that these policy issues must be addressed, the WG began developing a set of policies for the operation and maintenance of the proposed RES.
- Relevant requirements were considered during policy development, so that the policies covered how requirements were handled.

The basic outline for the development of RES policies was:

- Identify areas where policies are needed
 - Note: requirements were considered at this step
- Discuss and agree on what the policies should be
- Draft policies for the identified areas
- Collect draft policies into a draft policy document
- Review and edit draft policy document
- Check for any gaps or inconsistencies between the policies and the requirements, editing the policies if necessary
- Finalize policy document during a monthly WG telecon

- Definition of user roles
 - While not actually policies, they are required to understand the policies.
 - Roles cover system users and system maintainers/managers.
- User policies, two major aspects:
 - User statuses
 - User accounts and groups
- Downloads (including uploading and modifying assets)
- Communications with the community
- Intellectual property and copyright
- Privacy and security of information
- Support for users



Summary of Abilities by User Role

Abilities	Anonymous	Consumer	Provider	Content Manager	Administrator
Search, browse, and view assets	X	X	X	X	X
Send system feedback to Administrators	X	X	X	X	X
Download assets		X	X	X	X
Manage own account		X	X	X	X
Receive private messages and notifications		X	X	X	X
Comment on / rate assets		X	X	X	X
Upload / modify assets			X	X	X
Approve modifications to assets			X	X	X
Limited administrator rights, by download category				X	X
Full system administration rights					X



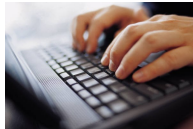
RES Policies Outline

Definitions of User Roles

UR1.0 – User Roles
UR1.1 – Anonymous User Role
UR1.2 – Consumer Role
UR1.3 – Provider Role
UR1.4 – Content Manager Role
UR1.5 – Administrator Role
Summary of Abilities by User Role
UR2.0 – Other Roles
UR2.1 – Site Curator Role
UR2.2 – NASA ESDS Software Reuse
WG Role

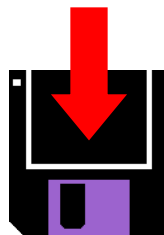
User Policies

U1.0 – User Statuses
U1.1 – Anonymous User Status
U1.2 – Consumer Status
U1.3 – Provider Status
U1.4 – Content Manager Status
U1.5 – Administrator Status
U2.0 – User Accounts and Groups
U2.1 – User Accounts
U2.2 – User Groups



Downloads

DL1.0 – Downloads
DL1.1 – Creating and Modifying
Downloads
DL1.2 – Contributing Assets
DL1.3 – Linking of Download
Versions/Modifications
DL1.4 – Deprecating Downloads
DL1.5 – Suspending Downloads
DL1.6 – Investigating Downloads
DL1.7 – Masking Downloads
DL1.8 – Deleting Downloads
DL1.9 – Prioritization of
Deprecating, Masking, and
Deleting
DL1.10 – Right of Administrators to
Take Action
DL1.11 – Reporting Broken
Downloads



Communications with the Community

C1.0 – Communications with the
Community
C1.1 – Commenting on Downloads
C1.2 – Rating Downloads
C1.3 – Handling User Feedback
C1.4 – Enforcing Policies
Intellectual Property and Copyrights
IP1.0 – Intellectual Property and
Copyrights
IP1.1 – Uploading Content
IP1.2 – Downloading and Using Content
IP1.3 – Open Source Software
IP1.4 – NASA Software Release Process
IP1.5 – Export Controlled Software

Privacy and Security of Information

PS1.0 – Privacy and Security of
Information

Support for Users

S1.0 – Support for Users
S1.1 – Support for Consumers
S1.2 – Support for Providers



- Each area has an overall policy, providing the general policy for this topic, followed by any number of specific policies for particular aspects of the topic area.
- Policies are structured as follows:

Policy X#.# – Policy Title

A short statement of the policy.

A longer description of the policy, including any explanatory text.

Policy U1.2 – Consumer Status

An Anonymous User may become a Consumer by registering for an account on the RES and having that request approved by an Administrator. Approval is granted if the following conditions are met: a person has registered the account (no automated registrations allowed).

All Consumers must be approved by the Administrators, who have the discretion to deny any registration request.

Policy DL1.11 – Reporting Broken Downloads

All users of the RES, regardless of their role, may report the download for an asset they have permission to view as broken.

The IP address of the person reporting the broken link is recorded to help track malicious abuse of the reporting system. The site administration is responsible for periodically checking the system for broken link reports and addressing them, with the assistance of the provider of the asset if necessary. If a broken link report is found to be valid and the original provider cannot be contacted to resolve the issue, the site administration reserves the right to deprecate or remove the asset from the RES.

Policy C1.4 – Enforcing Policies

Administrators will take actions as necessary to enforce the policies of the RES. This may include, but is not necessarily limited to, sending warning notices to offending users, banning IP addresses from the system, and deleting user accounts.

The policies of the RES have been created to produce a system that will best serve the reuse purposes of the Earth science community of software developers. Anyone who is found to be in violation of these policies, or otherwise abusing the RES or its users, will be subject to actions taken by the Administrators and/or RES staff. Typically, users will be given at least one warning, and thus a chance to change their behavior, before more serious measures are taken, such as banning the user's IP address or deleting the user's account.

Policy IP1.2 – Downloading and Using Content

Registered users must agree to abide by any constraints, restrictions, or license agreement terms that apply to the assets they download from the RES.

Consumers have the right to download any asset from the site and reuse it in part or whole on their projects. However, if the software contains assets listed under certain licenses such as the GNU General Public License (GPL), the Consumer may be obligated to certain conditions, such as making the source of their work available as well. The selling of software products or the use of such software in contracts may be limited based on the licensing associated with the software assets reused.

- The WG has reviewed and approved the current draft of the RES Policies document.
- Some minor modifications to the policies to ensure consistency with the RES requirements are being discussed.
- To ensure that these policies are appropriate, the WG will also have the document reviewed by:
 - ESDSWG Chair (next step, date TBD)
 - NASA Headquarters
 - Goddard's Innovative Partnerships Program (IPP) Office
 - NASA Legal Office, when/if it is deemed necessary



Req. Analysis & Trade Study



- Define the RES objectives (User's Needs)
- Establish the functionality (Functional Analysis)
- Establish performance requirements (Requirements Analysis)
- Identify and evaluate existing systems (Trade Study)

Architecture Study



- Evolve design and operations concepts (Architecture Synthesis)
- Select a baseline (Cost/Benefit Analysis)
- Verify that the baseline meets requirements (User's Needs)
- Validate that the baseline satisfies the user needs (User's Needs)
- Evaluate reuse of existing technologies (Prototyping)
- Iterate the process through lower level analysis (Decomposition)

Implementation & Deployment



- Develop the system by integrating existing tools and developing customized artifacts to meet the requirements
- Develop policies for operation and maintenance of the system
- Test the system and validate that the requirements are met
 - Deploy the system
 - Manage and maintain infrastructure (RES) and reusable software assets (Content)

*Currently, only a
prototype and only
informally tested.*

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- Use the specifications as defined in the Architecture Study to implement the RES.
 - A prototype has already been implemented using an existing software system (XOOPS).
 - Informal testing of the prototype by the Reuse WG is underway, and feedback received is being used to improve the system.
 - The implementation will be consistent with the requirements and policies.

- Implementation of a prototype RES NASA-only system
 - A prototype would demonstrate the usefulness of the RES and its effectiveness at meeting the reuse needs of the community of Earth science software developers.
 - The prototype can be built with existing resources already allocated to the Software Reuse WG.
 - The prototype system was developed in three builds (Sept. 2007, Oct. 2007, Dec. 2007) and one release of the complete system (spring 2008). Additional functionality and bug fixes are in alpha testing.
 - Development of the prototype is essentially complete and awaiting formal testing by the WG after completion and approval of a Test Plan.
- Deployment of the RES
 - First, the prototype would be deployed for NASA-only use and tested in this environment.
 - Following successful NASA-only use, permission for deployment to the wider scientific software development community would be sought.

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- Need to find a home for the proposed RES, considering:
 - Organizational structure needed
 - Costs involved
 - Benefits provided
 - Governance required
 - Work with ESDIS (as a starting point) on finding a suitable home for the proposed RES.
 - Need NASA Headquarters to offer guidance on an appropriate home for RES

- **Focusing on Science**
 - The community is asking for a Reuse Enablement System (RES) to develop their applications faster, cheaper, and more reliably.
- **Supporting Education and Public Outreach**
 - The RES can make NASA software available to the public for education and other applications faster and more efficiently.
- **Complying with Standards**
 - Availability of a Reuse Enablement System contributes to the Capability Maturity Model Integration (CMMI) and Federal Enterprise Architecture (FEA) compliance initiatives that NASA is working on.
- **Advancing Technologies**
 - The RES can enable new technologies such as Service Oriented Architecture (SOA) by making domain-specific services available to the community.



Backup Slides

- **Catalog** – a system that stores [links to assets](#), but does not host or store the assets themselves
- **Repository** – a system that hosts or [stores the actual assets](#) themselves
- Portals are often Web sites.
- *Catalogs and repositories are not necessarily Web sites, but may use a Web site as an interface.*

The Reuse WG made the following recommendation in Jan. 2004:

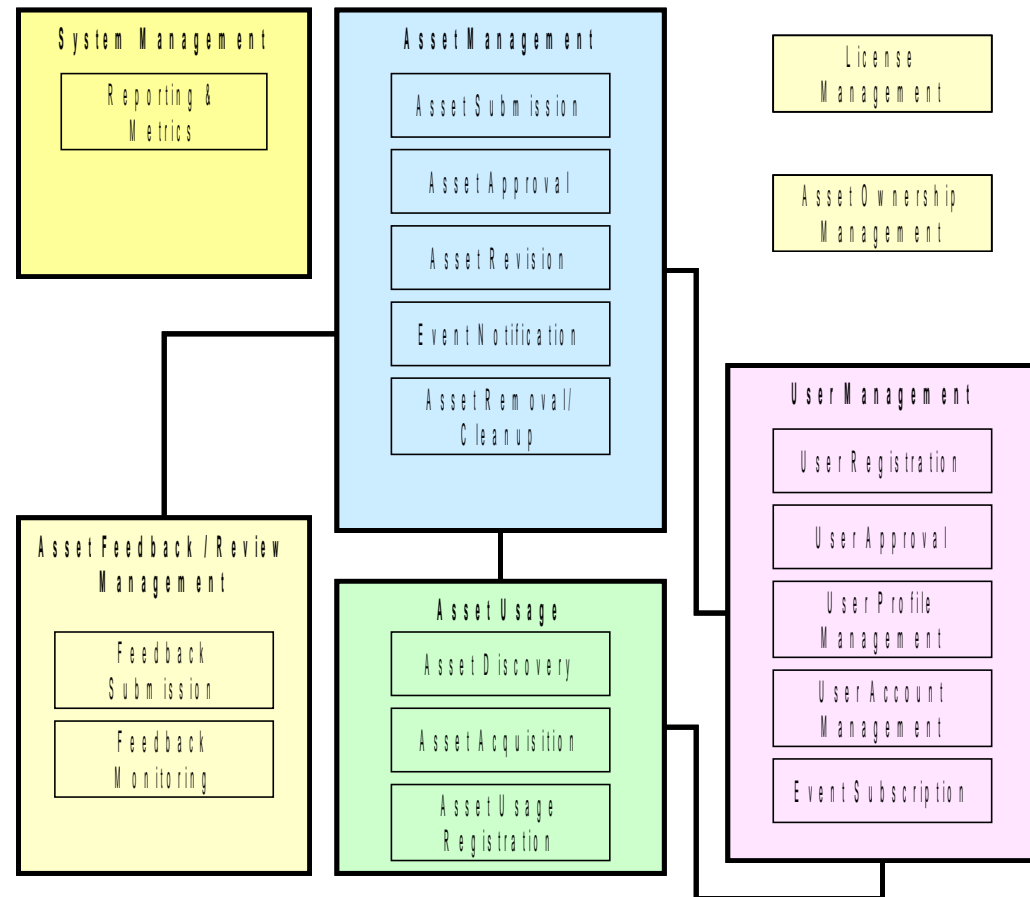
NASA should establish a system to facilitate the cataloging and distribution of reusable assets for the Earth science community

- NASA should establish an effective mechanism for dissemination of reusable software assets within the Earth science community.
- NASA should evaluate the technology options for the provision of a reuse enablement system including:
 - commercial reuse catalogs/repositories
 - open source reuse catalogs/repositories
 - use of existing publicly available catalogs/repositories
 - custom build of a community-specific catalog
- Based on the conclusions of the technology evaluation, NASA should implement a reuse enablement system.
- NASA should develop guidelines and standards for the management and operation of a reuse enablement system.



RES Requirements Overview

- The Reuse Working Group collaborated for several months in 2004 to identify the important functional requirements needed for a Reuse Enablement System (RES), as illustrated in the figure.
- Additional functional requirements:
 - Minimal Operation Support
 - Performance
 - Security
 - Technology
- Important non-functional requirements:
 - Domain (Earth science focus)
 - Type of assets provided (small-sized components)
- Primary users of a RES are NASA-funded software developers within the Earth science community who create software products.



See the Reuse Enablement System (RES) Requirements document revised May 7, 2007, for detailed descriptions of the requirements.

- The requirements developed by the Working Group and used in the Trade Study were revisited in summer 2006 to formalize them for use in the Architecture Study.
- Requirements were categorized into four major areas:
 - Users and User Information
 - Asset Storage and Management
 - Send and Manage Notifications
 - System Operations
- Each major category has a number of sub-categories for further classification of the requirements.
- In spring 2007, the requirements were re-titled and regrouped for clarity.
- The result was 54 requirements that are summarized in the RES Architecture Study and detailed in the RES Requirements document.
- Similarly, the RES use cases were formalized in summer 2006.

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- HQ agreement to review and provide feedback on the RES Policies document.
 - HQ advice on appropriate people to contact for reviewing the document or sections of it (e.g., IPP Office for issues related to technology transfer).
 - HQ guidance on how best to deploy the RES.



Background Information

About the Reuse Working Group



- About the NASA Earth Science Data Systems (ESDS) Software Reuse Working Group (WG):
 - The WG was started in 2004 to facilitate reuse of software assets within the NASA Earth science community.
 - Membership is limited to NASA-funded projects and investigators, though there have been many contributions from the general Earth science community.
 - The WG has been working to establish a “marketplace” for reusable Earth science software artifacts by working to increase the supply and availability of reusable assets.
 - Also, the WG has worked to increase the community capacity and desire for reuse by demonstrating the feasibility and value of reuse.
 - Through regular meetings of the full WG and a smaller support team, a variety of activities are performed to encourage and enable reuse.
- Goals of the Reuse WG include:
 - To spend less time, money, and effort on software development
 - To increase productivity and improve quality through reuse
 - To increase the number of available reusable assets

Reuse WG Charter Highlights

- Purpose
 - Address technical issues required to enable and facilitate reuse of software assets, including open source products, within the NASA Earth science community
- Goals
 - Demonstrate the feasibility and value of reuse
 - Increase the supply and availability of reusable assets
 - Make recognizable and easy-to-evaluate candidate reuse solutions
 - Minimize the cost of infrastructure activities to support the community's reuse activities
 - Increase community capacity and interest in reusing existing assets
 - Contribute to the removal of existing barriers to reuse
 - Recommend incentives to encourage reuse
- Scope
 - Facilitating reuse across projects and not interfering with local control of participating systems
 - Focusing on reuse process and not on technology infusion process
 - Focusing on reuse of existing assets rather than reusability of newly developed assets
 - Focusing not only on software code, but also on design artifacts (architectures, software designs, ICDs, test plans, etc.)
 - Focusing on reuse of proven operational and NASA Earth science specific software assets



Reuse WG Activities

Reuse Implementation Projects

Efforts that result in the publication or use of a reusable component

Support/Enablement Activities

Efforts that provide tools and mechanisms to enable reuse

Outreach and Education Activities

Efforts that increase community awareness and understanding of benefits, best practices, etc.

Policy Change Activities

Efforts to reduce policy barriers to reuse

Reuse Incentive Activities

Awards and structural changes that directly or indirectly encourage reuse

- Examples of work in some of these areas include:
 - Recommending that NASA create a **Reuse Enablement System** (repository) for Earth science reusable software assets; development of **Reuse Readiness Levels**
 - Creating a **web site to promote and provide information about reuse**
 - Providing NASA with **policy recommendations to encourage reuse**
 - Developing a **reuse peer-recognition award**